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ABSTRACT

In response to the problems created by a diminishing energy supply but an increasing energy demand, this second in a series of national reports studies the linkage of vocational education and energy. Through an examination of selected literature with reference to types of energy resources, the author identifies the emerging occupations related to the development of alternative energy sources and considers the relevance of these occupations to vocational education. (BM)

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ENERGY PROBLEMS PROVIDE JOB OPPORTUNITIES

by
Allen B. Moore

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ENERGY PROBLEMS PROVIDE JOB OPPORTUNITIES

by Allen B. Moore[1]

Introduction

The report has been developed for the U. S. Office of Education, Bureau of Occupational and Adult Education, Division of Research as part of the AIM/ARM contract with The Center for Vocational Education, Ohio State University, Columbus, Ohio. The second in a series of reports developed during 1977, Energy Problems Provide Job Opportunities examines selected literature[2] with reference to types of energy resources, the identification of emerging occupations related to the development of alternative energy sources, and the relevance of these occupations to vocational education.

The Problem

The United States' demand for energy is increasing exponentially. In fact, in terms of the present rate of consumption, the nation's energy requirements double every 10 years. The present energy supply, which consists primarily of fossil fuels (e.g., coal, oil, natural gas), cannot continue to meet the increasing demand.

Fossil fuels -- coal, oil and natural gas -- are nonrenewable. Most of the available supply of oil will have been consumed within a period of 70 years -- 1930-2000 (Figure 1). Similarly, the nation's supply of natural gas will also have been consumed within a 70-year period --- 1940-2010. Coal supplies may last

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[2] A computer search of the ERIC system yielded very few reports about energy and vocational education. Computer searches of the Energy Resources Development Administration (ERDA) data base produced a large number of reports about the complexities of energy resources by none relating the problem to vocational education. Therefore, literature for this paper have been identified in textbooks, speeches, journals, recent publications and newspaper articles.

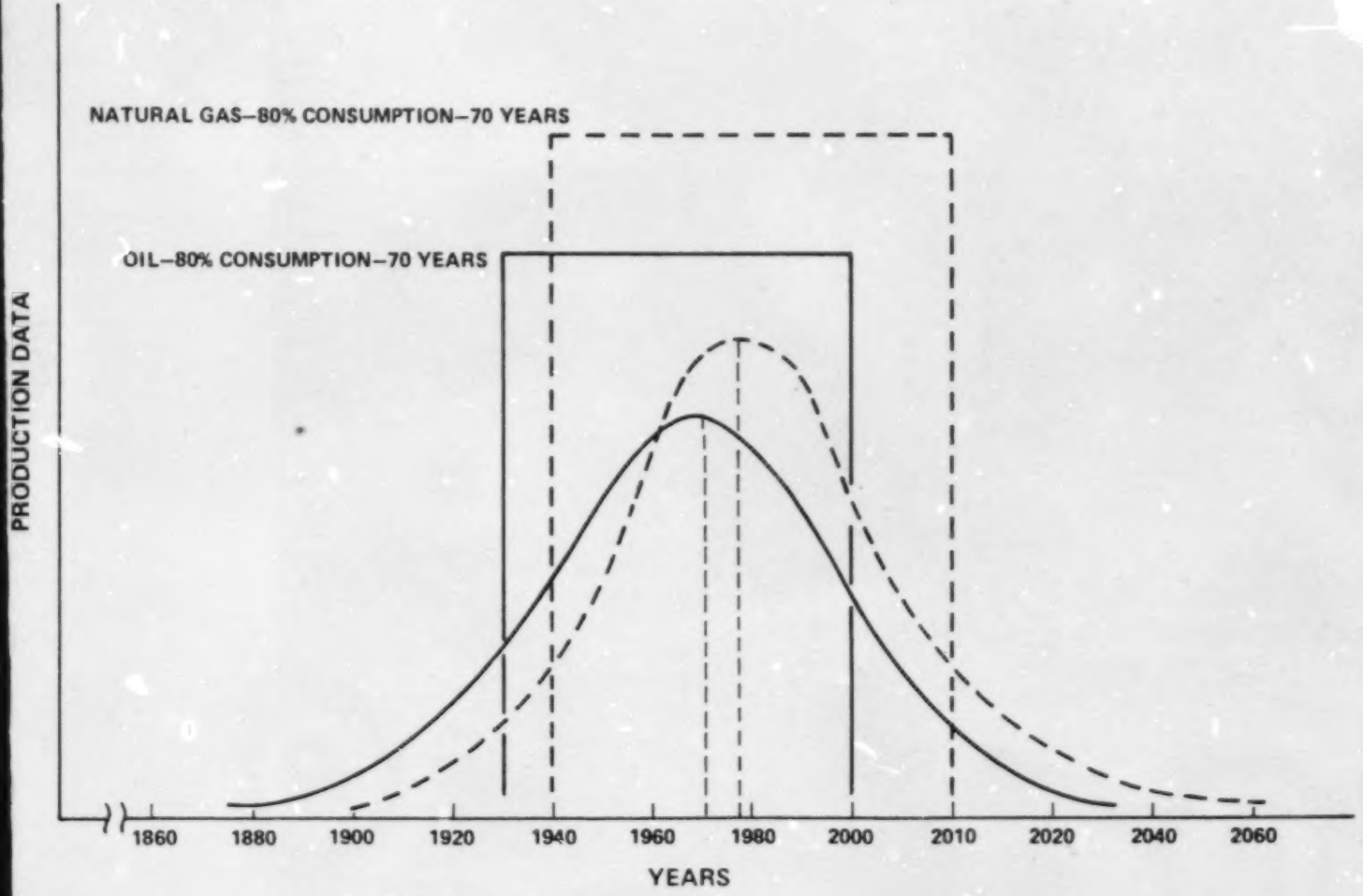
for a longer period of time --- 1800-2300 --- approximately 500 years.

In the next 25 years, the United States must confront the problem of its diminishing energy supply in the face of increasing demand. At the present time, there are two basic strategies for solving this problem: (1) energy conservation as a national priority and (2) the discovery and/or development of alternative energy sources. The education and training of youth and adults to understand the need for energy conservation and the development of alternative sources is essential for the success of both these strategies. Vocational education is one of the major avenues for training individuals to assume the new occupational roles which will be necessary to conserve, convert, and develop new energy resources.

Having pointed out the condition of diminishing supply of energy resources with an exponentially increasing demand and the need for a changing ethic from consumption to conservation, the remaining sections of this report deal with the linkage of vocational education and energy.

FIGURE 1

UNITED STATES CONSUMPTION OF OIL AND NATURAL GAS



REFERENCE: THE ILLUSTRATIONS ARE ADOPTED FROM DIX (2) AND PAZIK (12)

Linkage of Vocational Education to Developing Alternative Energy Sources

The President of the United States has presented an energy program[2] to the American people and the U.S. Congress. The debate about this proposed program is underway. At least two benefits will result from this program and debate: (1) United States will adopt a plan for action toward developing alternative energy sources and (2) the American public will be made more aware of the urgent need for identifying and developing these resources.

Part of the President's proposed program is the establishment of a cabinet level Energy Department in Government. This department will contain the Federal Energy Administration (FEA), the Energy Research and Development Administration (ERDA) and the Federal Power Commission (FPC). A single coordinated agency with the attention and commitment of the President and the American public can be a positive influence in developing alternative energy resources.

Vocational educators will want to study the proposed energy program, monitor data that indicates shifts in the labor market and prepare to adjust programs to train both youth and adults for energy related occupations. In "Establishing Priorities for Postsecondary Energy-Related Technology Programs" Walter J. Brooking[3] reports:

> "The number of technical workers in energy-related industries will increase from 135,000 in 1974 to 185,000 by 1985 at a rate of 5,000 a year, according to Shell. By 1985, about 13 million new jobs will be created in the nation's work force, with about a half-million of these jobs growing out of investments by the energy sector. Half of the new jobs in the energy sector will be operating and maintenance jobs and should be necessary for the life of the particular facilities involved."

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[2] The National Energy Plan. Executive Office of the President, Energy Policy and Planning. Submitted to the Congress of the United States, April 29, 1977. Superintendent of Documents, U.S. P.O. Washington, D.C.

[3] Brooking, Walter J. "Establishing Priorities for Post-Secondary Energy-Related Technology Programs." Technical Education News. May-June 1977 - p. 14 & 15

Thus, the training for personnel for energy-related occupations becomes an increasing concern for vocational educators. For discussion, some of these potential areas of employment that Mr. Brooking mentions have been listed under three major categories - (1) Home and Industry, (2) Transportation and (3) Policy Decision-Making.

Home and Industry

The home and industry area appears to offer the most potential for training and employment opportunities. Mills[4] (page 3) cited the potential for solar energy (and employment):

> In the United States today .... there are approximately 30,000,000 single family dwellings which are equipped with central forced warm air heating systems .... About 80% of these systems will require component replacement .... system renovation .... upgrade and add on during the next decade. Each of these dwellings .... with the proper incentive .... represents a potential solar user .... By retrofitting 10% of these dwellings to 60% reliance on solar energy for space heating .... the savings in fuel oil can be as great as ½ million barrels per day.

Regarding new housing starts, Mills points out (page 3):

> For the past 6 years, over 85% of the new housing starts were equipped with forced warm air heating systems .... slightly over 50% of the new houses had central air cooling systems installed or original equipment.

Speaking specifically about the potential increase in jobs, Mills reports (page 5):

> .... we can expect an increase in jobs somewhat in relation to the following:
>
> | | |
> |---|---|
> | •Sheet Metal Fabricators | 19 million hours |
> | •Sheet Metal Installers | 48 million hours |
> | •Asbestos Workers | 24 million hours |
> | •Carpenters | 12 million hours |
> | •Plumber or Fitters | 19 million hours |
> | •Roofers | 12 million hours |
> | For a total of | 134 million hours |
>
> OR 13.4 million hours per year
> OR 6700 man/woman years of new work

[4] Mills, Robert. "Residential Economic Consideration Market Potential" Speech at Solar Workshop, Ohio State University, June 26, 1977.

Additional home and industry energy conservation and resource development activities could include:

1. Retrofitting for conserving energy including insulation, storm windows and doors, solar heating and cooling.
2. Construction of underground dwellings and buildings.
3. Development of multi-family dwellings with common heating, cooling and cooking areas.
4. Development of single and multi-family windmills.
5. Development of woodburning cooking and heating systems.
6. Solid and liquid waste reclamation and recycling for energy.

These areas offer potential vocational program research, development, training and future employment opportunities.

Transportation

The need for mass transit systems, urban, suburban and rural transportation planning, and the interstate movement of products and materials is critically important to conserving energy resources. The conservation of these resources will obviously put some people out of jobs, but it also may offer employment opportunities locally that previously did not exist. Mills (page 7) cites some interesting statistics comparing the energy consumption of transportation and home/industries:

> According to a publication of the National Academy of Engineering titled, "U.S. Energy Prospects: An Engineering Viewpoint, 25% of our nation's gross energy usage is attributed to transportation.

Some of the major challenges facing the American public related to transportation include the following:

1. Mass transportation for urban, suburban and rural areas.
2. City and suburban land use planning.
3. Use of fuel mixtures (gasoline and alcohol) and related retrofitting automobiles.

These methods have implications for vocational and technical education programs involving youth and adults.

Policy Decision Making

In the next quarter of the century (1976-2000) policy decisions relating to energy use will have a very dramatic effect on the quality of life in the United States. Local, state and national leaders will need reliable data for decision making. These same individuals will need to balance the needs of people against the short and long-range predictions of available energy supplies. Use taxes, consumer incentives, alternative living and work arrangements, changing school calendars, working hours shifted to evenings in the summer and reduced number of days in the winter may all influence people and policy decisions. Ethics, quality of life, human relations, conservation and special interests will be the "watchmen" of decisions affecting the nation's economic and social conditions.

As energy sources diminish, policy decision making will be more important in the future than it has been in the past. Some of these decisions relate to the following:

1. Allocation of fuels (gasoline, oil and others) to priority sectors of local, regional and national economies.

2. Food crop production in local parks, recreation areas and public lands to meet local demands and reduce transportation costs.

3. Local incentives for energy conservation such as low cost transportation to shopping areas and credits for conserving energy resources.

4. Rearrangement of school and public office hours during critical energy demand periods.

Additional Occupational Opportunities

Obviously, there are additional job possibilities within existing occupational structures that deal with: (1) monitoring existing energy consumption; (2) collecting reliable energy data for consumers; (3) keeping people informed of improvements and problems related to energy consumption; (4) coal mining and technology related skills; (5) informing people about various energy efficient options at home, on the job, within the community and in leisure time activities.

In the next 2 to 3 years or more, there will be some confusion about what occupational areas are developing and the need for trained people to fill these jobs. However, the manpower information systems in operation in many states throughout the country can be instrumental in collecting data for curriculum development, education and training by vocational educators. Regional and national information data banks currently operated by the Federal Employment Service can be helpful in identifying the need for solar technicians in the sun belt regions and wind power generator personnel for the northwest and plain states. Truck farming technology of New Jersey and the eastern seaboard may be needed in the strip mine areas of the Appalachian Region where solar greenhouses can be constructed on south facing slopes for both energy sources and a food supply (e.g., tomatoes, strawberries, and greenbeans).

Vocational Education Unlimited

Each of the seven vocational education service areas has been examined for examples of energy conservation activities. It is believed that in some instances, conservation practices can lead to expanding occupational opportunities.

According to the current literature,[5,6,7] many of the planned energy conservation measures are best suited for the home, industry, and business. Therefore, service areas such as home economics, agriculture, business and office occupations may receive most immediate attention in an effort to conserve energy and convernt to alternative fuel supplies. Examples of such conservation practices and potential employment and training opportunities are listed by service area. Home economics is one of the vocational service areas that can have a tremendous impact on energy conservation. Conservation measures could include the following[8]:

- Installing at least six inches of insulation
- Using an attic fan instead of air conditioning
- Installing storm windows
- Turning off unused lights
- Turning up room air conditioner thermostats
- Fixing leaky faucets
- Taking showers instead of tub baths
- Using covered pans that fit heating element
- Planning several oven dishes for a meal - don't peek
- Filling dishwasher to capacity
- Turning down thermostat in winter; turn it up in summer for central air conditioning
- Caulking and weatherstriping windows and doors
- Turning off radio and TV when not in use
- Setting hot water temperature no higher than 140°. Insulating pipes and tank
- Servicing furnace once a year; checking filters regularly
- Washing in cold water when possible
- Filling dryer to capacity and don't run longer than necessary
- Keeping lint screen in dryer clean

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[5] Energy and Power. A Scientific American Book - W.H. Freeman and Company, San Francisco - 1971.

[6] Ford, K.W., et al. Efficient Use of Energy - American Institute of Physics - New York - 1975.

[7] Udall, Stewart, et al., The Energy Balloon. Penquin Books, Inc., New York - 1974.

[8] Tips on Saving Energy - Council on Better Business Bureaus, Washington, D.C. - 1977.

These are but a few of the specific activities that people can do to conserve energy in the home.

Other service areas offer potential energy savings and alternative fuel developments. Examples are listed by service area:

Agriculture

- Design a solar farm for heating, cooling, grain and grass curing
- Wind generation
- Composting manures
- Insulation of buildings
- Windmill repairs and/or replacements
- Heating with wood
- Minimum tillage
- Develop agriculture chemical substitutes

Business and Office Occupations

- Business office design
- Efficient use of machines
- Data processing for conservation
- Computer technology conserving energy (industrial heating/cooling)

Distributive Education

- Transportation systems for food, materials, people
- Marketing conservation of energy and products
- Advertising - the conservation of resources concept
- Merchandising by conservation-energy efficient methods
- Fashion and clothing design for efficient use of materials and energy required for production
- Distribution via energy conserving transportation

Health Occupations

- Retrofitting facilities
- Hospital design and maintenance for energy conservation
- Home health care and energy efficiency
- Care for elderly and maintaining energy needs
- Emergency care resources and allocation of their resources

Industrial Arts

- Introduction to energy conservation
- Energy conservation in designing, gathering resources, production and distribution
- Alternative fuel sources
- Energy conservation design for home, industry, business
- Equipment maintenance and safety in energy conservation

Trades & Industry

- Technology, energy and work design
- Shop and plant conservation
- Building maintenance and safety
- Existing technology for energy conservation, e.g., glass, solar panels, underground construction

Each of the vocational education service areas can make a contribution to identifying problems, designing studies and data gathering techniques, interpreting findings, designing education and training activities. Pogo[9] has stated the condition very well: "So why do we stand here confronted by insurmountable opportunities?"

[9] Pogo Comic Strip op. cit. Mills page 7.

ADDITIONAL LITERATURE SOURCES

1. Crowley, Gerald M. Energy 1975 - MacMillian Publishing Company, Inc., New York.

2. Dix, Samuel M. Energy: A Critical Decision For The United States Economy. Limited Edition. S.M. Dix & Associates. Grand Rapids, MI - January 1977.

3. Energy Reporter - Federal Energy Administration - December 1976 - January 1977

4. Firebaugh, Morris W. "Perspectives on Energy and the Environment" Physics Teacher - February 1977 - pp. 78-85.

5. Gould, Inc., Technology: Abandon Endure or Advance? Gould, Inc., Chicago Illinois (Md.)

6. Hammond, Allen L., et al. Energy and the Future. American Associates for the Advancement of Science - Washington, D.C. 1973

7. Kash, Don E., et al. Our Energy Future - 1976 University of Oklahoma Press, Norman

8. Mesaruvic, Mihajlo and Pertel, Edward. Mankind at the Turning Point (The Second Report to the Club of Rome) 1974. New York, The New American Library, Inc.

9. National Energy Program - U.S. Department of Commerce - March, 1975.

10. The National Energy Plan - Executive Office of the President, Energy Policy and Planning. Submitted to the Congress of U.S., April 29, 1977. Superintendent of Documents, USGPO, Washington, D.C.

11. Odum, Howard T., and Odum, Elizabeth C. Energy Basis for Man and Nature McGraw-Hill Book Company, New York - 1976.

12. Pazik, George. "Our Energy Predicament - A Special Editorial Feature." Fishing Facts - November 1976.

13. Priest, Joseph. Energy for a Technological Society: Principles/Problems/ Alternatives - Addison-Wesley Publishing Company - May 1975.

14. Stoker, H. Stephen, et al. Energy from Source to User. Scott, Foresman and Company - Glenview, Illinois. 1975.